1885MNRAS..46....2P

Directeur de l'Observatoire du Cap, M. Gill, et comme moi, que le moment est venu d'utiliser un semblable progrès pour entreprendre la carte complète de la voûte céleste en établissant une entente entre 6 ou 8 observatoires bien placés dans les deux hémisphères.

Nos clichés pouvant représenter 7° superficiels, il en faudrait 6,000 pour obtenir toute la voûte céleste, et qui, réunis par 4, donneraient 1,500 feuilles semblables aux cartes écliptiques de l'Observatoire de Paris.

Six, huit, ou dix ans au plus permettraient de réaliser ce vaste projet et de léguer aux siècles futurs une image très-exacte du ciel à la fin du 19^{e} siècle. La très-haute importance d'un tel projet, les nombreuses découvertes qu'il promet aux astronomes de l'avenir, m'engagent à vous prier de le soumettre à l'étude de votre illustre Société et de chercher, si on le croit réalisable, quel serait le moyen d'établir cette entente pour en préparer et en poursuivre l'exécution.

Veuillez agréer, Monsieur le Président, l'assurance
de ma haute considération,

Le Contre-Amiral, Directeur de l'Observatoire,
E. MOUCHEZ.

Observatoire de Paris:
le 20 *Juin,* 1885.

On Dr. Wilsing's Experimental Examination of the Wedge Photometer; and (II.) On the Degree of Accuracy attainable by means of that Instrument. By Prof. C. Pritchard, D.D., F.R.S.

In the *Astronomische Nachrichten* for Sept. 14, 1885 (No. 2680), Dr. Wilsing, of Potsdam, has honoured me by a very able and very elaborate criticism on the Wedge Photometer, extending over eighteen columns, and conceived in a fair and discriminating spirit. Dr. Wilsing's remarks apply chiefly to—

1. The possible influences on the measured magnitude of the fainter stars, when the brightness of the ground forms an important fractional part of the total intensity.
2. To non-invariability of the eye for any length of time.
3. To the effect of colour.

Such criticisms of new work are very valuable, and are so many posts on the road towards the establishment of fact. When Dr. Wilsing wrote this article on July 1 he was not aware of my paper, which was read and discussed at the June meeting of the Royal Astronomical Society; moreover, he was not in possession of that portion of the Oxford Photometry which applied to stars of the fifth and sixth magnitudes, and it is mainly on these stars of a fainter lustre, that some question has arisen as to the effect of the luminosity, greater or less, of the background, which he

1885MNRAS..46....2P

considers, with Prof. Pickering, may affect the concluded magnitudes of the fainter stars. The whole catalogue, formed on Argelander's *Uranometria Nova*, is now completely printed, and will be published, together with an Introduction, by the Delegates of the Clarendon Press, by the time the present communication reaches the Fellows of the Society in print.

I will now take the leading points of Dr. Wilsing's criticism into consideration, *seriatim*, and make such remarks as I conceive may closely bear upon the subjects, and be interesting to the Society.

Dr. Wilsing commences his critique by referring to physiological questions regarding the impressions of light on the eye; especially in relation to Fechner's law and experiments connected therewith. Fechner has virtually translated the physical relations of light, in its passage through media, into nerve-impressions on the brain; and he has extended them with some ingenuity to other sensations besides those of light. With regard to these obscure physiological relations, I desire to keep aloof from them in this communication to the Royal Astronomical Society, and I propose to confine myself solely to the region of experimental and observational fact.

The results of Fechner's experiments, so far as I understand them, are these. In regard to intensities of light, not extreme in their character, he states that an alteration in the intensity of light will be perceptible to the eye, if it amount to about one-hundredth of the whole. I confess I was at first disinclined to suppose that so small a variation was within the limits of appreciation. I resolved therefore to repeat Fechner's experiment, and it has been so repeated at the University Observatory. Two contiguous shadows were formed on white paper, by two lights, which effectively differed, approximately in the ratio of 100 : 1. The difference between the illuminations represented by 100 and 101 was just perceptible, and it was only with hesitation that it could be said the same remark was not applicable even to the ratio 120 : 121. The experiment was varied by *looking through tracing paper*, instead of confining it to *reflected* light, and with approximately the same results. We are therefore constrained to admit that such feeble differences of light are in reality capable of producing impressions on the visual organs under the conditions aforesaid.

There is also another remark of Fechner's which may be found to bear more or less on stellar photometry, to the effect that it is the *ratio* of the difference to the whole which is capable of making visual impression, rather than the feeble illumination in and by itself. This fact was virtually, though not formally, known to the Greek astronomers, who divided their successive magnitudes into thirds, whether they referred these subdivisions of light to the first or to the sixth magnitude; and it will be remembered that one-third of the light of a first magnitude star is in intensity equal to about *thirty* times the whole light of a

1885MNRAS..46....2P

sixth magnitude star. This may appear a somewhat startling remark, nevertheless it expresses a fact.

Now it is mainly on this capacity of the human eye for the discrimination of feeble differences in the ratio of two lights, that it has been conceived that the background on which stars are viewed may exercise an influence on the determination of the magnitude of feeble stars, not much brighter than the background itself, on which they are projected. The preceding considerations are entirely theoretical as applied *to the case of stars in the sky*, with which alone we have now to deal. In my last communication to the Society I showed that, so far as *Polaris** was concerned, its apparent magnitude was not affected in the telescope by the phase of the Moon; and it was also shown that on making a selection of stars in various parts of the heavens, differing greatly in stellar density, no effects of this varying density could be detected by a comparison between the resulting magnitudes in the Harvard and Oxford tables to the fourth magnitude. Prosecuting this inquiry still further into the case of the stars of the fifth and sixth magnitudes, now that my whole catalogue is completed, I have found that this same remark still holds as respects the non-interference of background or stellar density; always remembering two facts—first, that the comparison is made with the Harvard Catalogue; and secondly, that the least difference of light measurable in stellar photometry, whether by the wedge or any other known sidereal photometer, does not go beyond the thirteenth or fourteenth of a magnitude, instead of reaching nearly to the hundredth of a magnitude, as suggested by Fechner and confirmed at Oxford. This latter remark is of prime importance. The feeble differences in light ratio of 100 : 1 referred to in Fechner's experiment, apply solely to large illuminated *surfaces*, viewed with both eyes, and not to mere *points* of light viewed with such instrumental appliances as exist in sidereal photometry. Even in Seidel's instrument, where the stars are expanded into discs, no greater delicacy of discrimination existed than in the Wedge, or in the Zöllner, or in the Meridian Photometer. Sidereal photometry, definite and beautiful as I regard it to be, in its recent aspects, is not of such delicacy that tests and strictures which properly apply to such inquiries as Fechner's are legitimately applicable, or even possible, when applied to the stars. Moreover, minute disturbing influences which may properly be taken into account in experiments and theoretical inquiries regarding the measurability of impressions of light in general, are negligible, and in fact *must* be neglected in all cases of sidereal photometry.

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* If it be remarked that the effect of the moonlight is there examined in reference only to so bright a star as *Polaris*, it may be sufficient to state that ordinary scattered moonlight is extinguished by the wedge, in the 4-inch telescope, at less than an inch from the thinner end, whereas a star of the sixth magnitude is extinguished therein, at a place on the wedge more than two inches and a half from the extremity.

1885MNRAS..46....2P

The presence of other stars in the field of the telescope, as limited by the photometer, produces a background of a different character from that already described. This field of view in the 4-inch telescope is confined to a circle of 0·02 inches diameter in the focal field, equivalent to about 80″. A reference to Argelander's charts will indicate the fact that in very few instances indeed will so contracted a field comprise with a sixth magnitude star any other star ranging from the seventh to the tenth magnitude. A seventh magnitude is very rare: if it be within 20″ of the star to be measured, then it would be placed in the category of double stars, and its character would be referred to in the Notes. It would, if viewed as one point of light, coalesce with a sixth magnitude, and would have a combined result of 5·6. If, on the other hand, the small star, or the two or three small stars in the field, be detached from the brighter star they would produce distinct impressions on the retina, *and would be completely extinguished by the wedge* long before the extinction of the brighter, and could produce absolutely no influence on its measure in the photometer. Precisely the same sort of reasoning applies to the measurement of fainter stars in a larger telescope, say of twelve inches or any greater aperture. The photometric field in such telescopes is still more restricted, and the very faint stars possibly accompanying the one to be measured, would either coalesce as a double or multiple star, and be noted as such; or they would be extinguished by the wedge long before the extinction of the brighter.

The effect of the coalescence of two stars upon the magnitude of the brighter is shown in the following short table:—

Difference in Mag. of two Stars whose lights coalesce.	Resulting addition of brightness to the brighter Star in Mag.	Difference in Mag. of two Stars whose lights coalesce.	Resulting addition of brightness to the brighter Star in Mag.
0·0	0·75	2.0	0·16
0·5	0·53	3·0	0·07
1·0	0·37	4·0	0·03
1·5	0·25	5·0	0·01

These considerations are sufficient to indicate the freedom of this form of photometer from the influence of the greater or less density of stars illuminating various regions of the heavens (always within the limits of accuracy prescribed).

I come now to another point insisted on by Dr. Wilsing—viz. the varying sensitiveness and fatigue of the observer's eye in the course of observations during any one night, and at remotely distant intervals of time. This is a fair question, requiring a fair consideration. The consideration which I shall give it is, as in other parts of this paper, a practical one; and it does not extend to such extreme cases as some of those referred to by Dr. Wilsing—viz. to a continuation of the observations throughout *five* hours on a single night. In order to assure myself of the non-existence

1885MNRAS..46....2P

of this source of error, a large number of extinctions of *Polaris* made on separate nights have been examined. These extinctions of *Polaris* are usually made three times on each night—viz. at the beginning, the middle, and the end of the series. No trace of a systematic difference is found, indicating symptoms of varying sensitiveness of the observer's eye, depending on these sequences of time. Moreover, as the measures are strictly differential, and as the mean of the three sets of readings of the extinction of *Polaris* (which rarely differ much *inter se*) is used for all the observations of the series, the mean condition of the eye is maintained throughout. In point of fact, there are continual breaks in the work of observation, connected with the shifting of the dome, the identification of the stars, and recording the results; and the whole series is rarely permitted to occupy more than three hours in the night. All these circumstances combine to prevent any undue strain on the eye of the observer.

Regarding the question of colour, another point in Dr. Wilsing's critical examination, I can only repeat what has been so strongly insisted upon in vol. xlvii. of the Society's *Memoirs*, viz. that so far as colours not very salient are concerned, the wedge interval for them is identical with that for light in general. At the same time I cannot repress the conviction that the photometry of intense colours is not as yet accomplished.

II.

On the Amount of Accuracy attainable by the Wedge Photometer.

In order that there may be no misapprehension as to the actual amount of accordance existing between the individual measures, or between the several determinations of adopted magnitudes derived from taking the mean of the former, I append the two following tables. The first gives the detail of one night's work, of an average character, on the extinction of *Polaris*, and on the determination of the magnitude of one star (72 *Tauri*), as the result of the mean of the four sets of five measures which form the usual or normal method of the two observers. Sufficient explanation is afforded by the headings of the several columns.

The second table gives the results of ten or twelve nights' repetition of the determinations of the magnitude of each of sixteen selected stars. They comprise among them, as a matter of interest, the seven *lucidæ* in *Ursa Major*, and also μ and R. 204 *Andromedæ*; the latter were used in the determination of the varying magnitude of the *Nova* in the *Andromeda* nebula, from nearly its first outburst to the time when it seemed to settle down into a star of approximately the tenth magnitude.

TABLE I.

Original Observations for the Determination of the Difference of Magnitude of Polaris and 72 Tauri.

Date and Instrument employed.	Original Readings of Wedge for extinction of 72 *Tauri.*	Mean Wedge Readings of extinction of *Polaris* at beginning, middle, and end of series.	Wedge Interval in inches.	Magnitude equivalent to Wedge Interval.	Assumed Magnitude of *Polaris.*	Resulting Magnitude of 72 *Tauri.*	Finally adopted Mean Mag.
	in.	in.					
1884, Dec. 20.	2·65	4·602					
With Wedge A on 4-inch	·53	·592					
telescope.	·72	·606					
	·65						
	·71						
Mean	2·652	4·600	... ...	3·56	2·05	**5·61**	
With Wedge A on 2-inch	1·90	3·828					
telescope.	·83	·868					
	·79	·840					
	·92						
	·86						
Mean	1·862	3·845	... ...	3·69	2·05	**5·74**	**5·65**

1885MNRAS..46....2P

1885MNRAS..46....2P

Date and Instrument employed.	Original Readings of Wedge for extinction of 72 *Tauri.*	Mean Wedge Readings of extinction of *Polaris* at beginning, middle, and end of series.	Wedge Interval in inches.	Magnitude equivalent to Wedge Interval.	Assumed Magnitude of *Polaris.*	Resulting Magnitude of 72 *Tauri.*
	in.	in.				
With Wedge B on 3-inch telescope.	1·30	2·682				
	·27	·698				
	·29	·682				
	·34					
	·26					
Mean … …	1·292	2·687	1·395	3·62	2·05	**5·67**
With Wedge B on 1½-inch telescope.	0·71	2·076				
	·60	·084				
	·74	·062				
	·70					
	·79					
Mean … …	0·708	2·074	1·366	3·54	2·05	**5·59**

1885MNRAS..46....2P

TABLE II.

Magnitudes of Stars observed on many Nights.

β Ursæ Majoris.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
2·913	2·14	20
3·062	2·20	10
3·070	2·18	10
3·078	2·15	10
3·081	2·09	10
3·089	2·09	10
3·092	2·10	10
5·467	2·19	10
5·483	2·27	10
5·485	2·30	10

Mean ... ... **2·17**

Average deviation 0·06

α Ursæ Majoris.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
2·913	1·90	20
3·062	1·92	10
3·070	1·85	10
3·078	1·90	10
3·081	1·98	10
3·089	1·89	10
3·092	1·92	10
5·467	1·88	10
5·483	1·81	10
5·485	1·80	10

Mean ... ... **1·89**

Average deviation 0·04

γ Ursæ Majoris.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
2·938	2·34	20
3·062	2·31	10
3·070	2·27	10
3·095	2·20	10
3·100	2·31	10
5·467	2·45	10
5·483	2·19	10
5·485	2·28	10
5·505	2·47	10
5·514	2·13	10
5·519	2·15	10
5·533	2·45	10

Mean ... ... **2·30**

Average deviation 0·09

δ Ursæ Majoris.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
2·938	3·39	20
3·062	3·37	10
3·070	3·36	10
3·095	3·36	10
3·100	3·53	10
5·467	3·40	10
5·483	3·43	10
5·485	3·55	10
5·505	3·34	10
5·514	3·56	10
5·519	3·37	10
5·552	3·35	10

Mean ... ... **3·41**

Average deviation 0·06

ε Ursæ Majoris.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
2·938	1·80	20
5·467	1·70	10
5·483	1·91	10
5·485	1·75	10

ζ Ursæ Majoris.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
2·938	1·95	20
5·467	2·08	10
5·483	2·18	10
5·485	2·14	10

1885MNRAS..46....2P

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
	ε Ursæ Majoris.	
5·505	1·70	10
5·514	1·79	10
5·519	1·89	10
5·533	1·80	10
5·552	1·85	10
5·565	1·79	10
Mean ...	... **1·80**	
Average deviation 0·06		
	η Ursæ Majoris.	
2·957	1·75	20
5·467	1·69	10
5·483	1·79	10
5·485	1·83	10
5·505	1·67	10
5·514	1·79	10
5·519	1·88	10
5·533	1·80	10
5·552	1·75	10
5·565	1·73	10
Mean ...	... **1·77**	
Average deviation 0·05		
	γ Cassiopeiæ.	
2·810	2·19	20
5·514	2·27	10
5·519	2·22	10
5·533	2·21	10
5·552	2·42	10
5·565	2·50	10
5·571	2·55	10
5·574	2·34	10
5·724	2·34	10
5·732	2·24	10
5·738	2·14	10
5·749	2·27	10
5·751	2·27	10
Mean ...	... **2·23**	
Average deviation ·09		

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
	ζ Ursæ Majoris.	
5·505	2·16	10
5·514	2·04	10
5·519	2·23	10
5·533	2·02	10
5·552	2·09	10
5·565	2·03	10
Mean ...	... **2·09**	
Average deviation 0·07		
	β Cassiopeiæ.	
2·835	2·32	20
5·514	2·34	10
5·519	2·40	10
5·533	2·35	10
5·552	2·36	10
5·565	2·52	10
5·571	2·56	10
5·574	2·43	10
5·697	2·42	10
5·724	2·32	10
Mean ...	... **2·40**	
Average deviation 0·07		
	δ Cassiopeiæ.	
2·810	2·89	20
5·514	2·89	10
5·519	2·94	10
5·533	2·93	10
5·552	3·02	10
5·565	2·88	10
5·571	2·91	10
5·574	2·92	10
5·697	2·84	10
5·724	2·81	10
5·732	2·94	10
Mean ...	... **2·91**	
Average deviation ·04		

1885MNRAS..46....2P

α Cygni.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
2·430	1·38	20
3·068	1·31	10
3·148	1·33	10
3·164	1·28	10
3·167	1·25	10
3·170	1·34	10
5·533	1·39	10
5·552	1·42	10
5·565	1·25	10
5·574	1·30	10

Mean ... ... **1·33**

Average deviation ·05

γ Cygni.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
2·430	2·28	20
3·068	2·23	10
5·533	2·35	10
5·552	2·31	10
5·565	2·17	10
5·574	2·18	10
5·724	2·31	10
5·732	2·18	10
5·738	2·21	10
5·749	2·31	10
5·751	2·22	10

Mean ... ... **2·28**

Average deviation ·06

η Persei.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
2·699	4·14	20
2·702	4·13	20
2·705	4·09	20
2·708	4·19	20
3·103	4·14	10
3·106	4·05	10
3·108	4·13	10
3·169	4·13	10
3·174	4·09	10
3·207	4·14	10

Mean ... ... **4·12**

Average deviation ·03

α Andromedæ.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
2·685	2·01	20
2·693	2·05	20
2·697	2·09	20
5·533	2·02	10
5·552	2·24	10
5·565	2·17	10
5·574	2·02	10
5·697	2·00	10
5·721	2·05	10
5·732	2·03	10
5·749	2·02	10
5·751	2·05	10

Mean ... ... **2·05**

Average deviation ·05

μ Andromedæ.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
2·693	3·98	20
5·692	3·94	10
5·692	3·89	10
5·697	3·90	10
5·724	3·95	10
5·724	3·96	10
5·732	3·85	10

R. 204.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
4·012	5·92	20
5·697	5·95	10
5·724	6·11	10
5·724	6·03	10
5·732	6·01	10
5·735	5·92	10
5·738	5·87	10

1885MNRAS..46....2P

μ Andromedæ.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
5·735	3·91	10
5·738	3·96	10
5·749	3·91	10
5·752	3·98	10
5·757	3·97	10
5·782	3·93	10
5·792	3·97	10
Mean ...	... **3·94**	

Average deviation ·03

R. 204.

Date of Observation 1880.	Individual Magnitudes.	No. of Extinction.
5·749	5·86	10
5·752	5·88	10
5·757	5·99	10
5·782	5·98	10
5·792	3·97	10
Mean ...	... **5·96**	

Average deviation ·06

From these two tables conclusions of considerable interest and importance may be derived in relation to the amount of accuracy to be looked for in the determinations of magnitude published in the *Uranometria Nova Oxoniensis.*

On inspection of the second table, it appears that very little improvement in accuracy is gained in general by repeating the measures through many nights, provided the first twenty usual determinations are made on a night free from abnormal or saliently varying meteorological conditions. Nevertheless, a small number of discordances do, and I fear must, occasionally occur, and nothing but re-observations can eliminate such errors from any catalogue. The final results, so far as my powers of scrutiny extend, exhibit no symptoms of systematic error. The average deviation from the mean for all these repeated observations on so many nights still remains approximately the same as for stars measured in the normal manner on a single fair night, viz. about 0·06 magnitude; and this, I think, represents in reality the utmost average delicacy attainable with the Wedge Photometer, and I claim for it an accuracy at least as great as has been yet attained by any other instrument.

This magnitude 0·06 corresponds to about $\frac{1}{18}$ of the whole light of the star whose magnitude is measured; and it must be remembered that it involves the combination of the error made in the extinction of *Polaris* with that of the star. In order to compare this result with the accuracy attained in other photometrical experiments such as Fechner's, &c., it will be necessary to divide this amount by $\sqrt{2}$, which gives $\frac{1}{25}$ of the light, as the limit of sensitiveness of this species of observation. As we have already seen, the utmost delicacy of appreciation attainable by shadows, as exhibited by my own repetition and modification of Fechner's experiment, is $\frac{1}{100}$ of the whole light. Bouguer sets it down, from his own researches, as $\frac{1}{64}$ approximately. Mr. Dixon, in some recent photometrical experiments on lighthouse illuminants, regards it as practically about $\frac{1}{50}$. Such being the

1885MNRAS..46....2P

case, even when the lights are on surfaces of appreciable extent, and viewed leisurely by both eyes, $\frac{1}{25}$ of the whole light is, after all, a not unsatisfactory amount of discriminating power in the case of a star viewed with a single eye as a point, and with that eye under a certain degree of instrumental constraint.

Lastly, I append a list—I wish it were a shorter one—of all the stars in the Northern Hemisphere where I find a difference exceeding one-third of a magnitude between the Harvard and Oxford catalogues, referred to the same scale in relation to *Polaris.* Wherever I found the existence of this amount of difference, I felt it desirable to repeat my observation. In almost every instance, as shown by the notes in my *Uranometria,* I have (within the prescribed limit of error) recovered the determination previously made. This is in accordance with the remark made respecting the sixteen stars set down in Table II. Still I do not by any means intend to affirm a conviction that my own results are always unimpeachable. It may be remarked that these stars are scattered through all magnitudes, and over all parts of the sky. They amount to about five per cent. of the whole number observed, and it must not be forgotten that these discordances in the two catalogues are derived from differences of measures of *two* stars, each affected with its own error of observations; in point of fact there are four independent fallible measures in each of the discordances arising from the comparison of the two catalogues.

Table III.

List of Stars in the Harvard and Oxford Catalogue (Uranometria Nova Oxoniensis) in which the difference exceeds one-third of a Magnitude.

Name of Star.	Mag. at Oxford.	Mag. at Harvard —0·1.	Difference.
ι Androm.	4·56	4·20	0·36
32 Aquarii	5·60	5·14	·46
P. XXI. 421	6·07	5·75	·32
67 Aquarii	6·45	6·10	·35
P. XXII. 250	6·05	5·67	·38
χ Aquarii	5·52	5·05	0·47
5 Aquilæ	6·09	5·65	·44
ν Aquilæ	5·08	4·70	·38
τ′ Arietis	5·42	5·08	·34
R. 1328	5·85	5·44	·41
19 Aurigæ	5·42	5·00	0·42
θ „	3·03	2·57	·46
κ „	4·81	4·36	? Var.
α Boötis	+0·69	+1·07	·38
B. A. C. 4830	6·10	5·74	·36

1885MNRAS..46....2P

Name of Star.	Mag. at Oxford.	Mag. at Harvard −0·1.	Difference.
ν′ Boötis	4·64	4·99	0·35
P. III. 51	4·55	4·06	·49
P. III. 177	5·03	4·65	·38
3 Camelop.	5·78	5·27	·51
31 "	5·52	5·13	·39
μ Cancri	5·55	5·15	0·40
ψ "	6·02	5·68	·34
P. VIII. 67	5·38	4·99	·39
o Cancri	5·53	5·11	·42
β Can. Ven.	4·53	4·20	·33
R. 3074	5·96	6·34	0·38
Sirius	+1·95	+2·53	·58
η Can. Min.	5·66	5·21	·45
1 Cassiop.	5·22	4·89	·33
4 "	5·49	5·07	·42
P. o. 118	5·48	4·90	0·58
ξ Cassiop.	5·19	4·70	·49
P. o. 162	5·70	5·26	·44
θ Cassiop.	4·68	4·33	·35
50 "	4·40	3·96	·44
ν Cephei	4·84	4·40	0·44
ε "	4·76	4·14	·62
B. A. C. 8180	5·98	5·61	·37
13 Comæ	5·47	4·99	·48
16 "	5·39	4·99	·40
μ Aquilæ	5·10	5·58	? Var.
δ Coronæ	4·87	4·46	·41
15 Cygni	5·42	4·93	·49
22 "	5·14	4·57	·57
25 "	5·52	5·10	·42
47 Cygni	5·03	4·67	0·36
λ "	4·90	4·47	·43
55 "	5·39	4·90	·49
ε Delphini	3·59	4·03	·44
π Draco.	4·84	4·45	·39

1885MNRAS..46....2P

Name of Star.	Mag. at Oxford.	Mag. at Harvard −0·1.	Difference.
P. XX. 376	6·15	5·80	0·35
4 Equulei	5·76	6·08	·32
ν Geminor.	4·33	3·88	·45
30 „	5·19	4·52	·67
33 „	5·75	5·34	·41
ρ Geminor.	4·45	4·05	0·40
ο „	5·02	4·57	·45
β „	1·36	1·02	·34
λ Herculis	4·70	4·19	·51
87 „	5 73	5·29	·44
W. B. XVII. 1438	6·17	5·56	0·61
98 Herculis	5·68	5·28	·40
W. B. XVIII. 76	5·91	5·54	·37
η Hydræ	4·42	4·07	·35
ρ „	4·66	4·21	·45
L. 17835	6·00	5·51	0·49
1 Lacertæ	4·64	4·04	·60
W. B. XXII. 1133	6·06	5·50	·56
81 Leonis	5·77	5·37	·40
86 „	6·03	5·62	·41
89 Leonis	6·09	5·63	0·46
2 Lyncis	4·73	4·23	·50
21 „	4·88	4.47	·41
P. VII. 169	5·50	5·10	·40
B. A. C. 6203	5·66	5·24	·42
W. B. XVIII. 794	5·62	5·29	0·33
θ Lyræ	4·64	4·24	·40
8 Monocerotis	4·89	4·30	·59
12 „	6·03	5·59	·44
P. VI. 257	5·98	5·62	·36
68 Ophiuchi	4·75	4·32	? Var.
67 „	4·35	3·92	0·43
70 „	4·35	4·01	·34
π^2 Orion.	4·86	4·32	·54
π^3 „	3·62	3·23	·39

1885MNRAS..46....2P

Name of Star.	Mag. at Oxford.	Mag. at Harvard −0·1.	Difference.
τ Orion.	3·95	3·55	0·40
υ ,,	4·91	4·56	0·35
42 ,,	5·45	4·50	? Var.
45 ,,	5·78	4·85	? Var.
W. B. V. 1048	6·00	5·58	0·42
χ′ Orion.	5·06	4·55	0·51
L. 11382	5·04	4·63	? Var.
μ Orion.	4·69	4·19	0·50
15 Pegasi	5·92	5·53	·39
ι ,,	4·24	3·89	·35
52 Pegasi	6·22	5·76	0·46
70 ,,	5·04	4·55	·49
16 Persei	4·77	4·33	·44
σ ,,	4·73	4·29	·44
ο ,,	4·40	3·91	·49
W. B. III. 942	5·93	5·60	0·33
27 Piscium	5·30	4·93	·37
47 ,,	4·94	5·27	·33
58 ,,	6·00	5·60	·40
τ ,,	4·24	4·63	·39
λ Serpentis	4·68	4·25	0·43
π ,,	4·48	4·89	·41
59 ,,	5·50	5·11	·39
15 Sextantis	4·89	4·41	·48
D. M. + 21° No. 539	5·99	5·58	·41
P. III. 215	6·07	5·58	0·49
P. III. 234	5·80	5·45	·35
37 Tauri	4·84	4·35	·49
ω ,,	5·08	4·55	·53
71 ,,	5·03	4·51	·52
P. IV. 82	6·00	5·58	0·42
109 Tauri	5·44	5·05	·39
115 ,,	5·69	5·28	·41
121 ,,	5·77	5·33	·44
B.A.C. 516	5·66	5·27	·39

1885MNRAS..46....2P

Name of Star.	Mag. at Oxford.	Mag. at Harvard −0·1.	Difference.
10 Trianguli	5·55	5·19	0·36
24 Ursæ Majoris	4·92	4·49	·43
φ „	4·73	4·33	·40
B.A.C. 3821	6·06	6·47	·41
„ 3985	5·58	5·23	·35
5 Ursæ Minoris	4·72	4·19	0·53
P. XVI. 182	5·92	5·44	·48
ξ Virginis	5·21	4·82	·39
64 „	5·97	5·58	·39
71 „	5·93	5·56	·37
84 Virginis	6·00	5·63	0·37
P. XIV. 12	5·44	4·87	? Var.
109 Virginis	4·04	3·62	·42
110 „	4·99	4·46	·53
12 Vulpec.	5·49	4·92	·57
13 Vulpec.	4·97	4·56	0·41
B.A.C. 6966	5·09	4·66	·43
λ Ceti	4·93	4·50	·43
31 Leonis	4·87	4·50	·37
χ „	4·98	4·62	·36

On summing up the details of the two catalogues as completed, I find that there exists a mean difference of magnitude of 0·15 in the magnitude of a single star. The mean difference between my magnitudes and those given in the *Durchmusterung* is 0·06 mag. These two catalogues, therefore, notwithstanding many individual discordances, may, in the average and on the whole, be regarded as in substantial agreement.

It will be remarked in reference to the above list, that it comprises stars of all magnitudes, though principally stars fainter than the third. They are scattered over all parts of the sky. They comprise about four per cent. of the whole number of stars compared. Each of them has been purposely re-observed at Oxford. But it must not be overlooked that the discordances are in reality between *four* fallible measures.

The result of our labours at Oxford is now open to scientific scrutiny. Inasmuch as this *Uranometria* is the first complete and

1885MNRAS..46....2P

systematic research of the kind, undertaken photometrically by a European astronomer, it can scarcely fail to possess some historical relation. If, as I hope and anticipate, its general usefulness and accuracy shall be acknowledged, I trust it will not be forgotten that a very considerable share of both is due to the intelligent, unremitting, and scrupulous attention of the two assistants, Mr. W. E. Plummer, F.R.A.S., and Mr. C. A. Jenkins, F.R.A.S., by whom the necessary instrumental measurements have been made; in the aggregate they exceed seventy thousand.

Photometric Observations of the Nova in the Andromeda Nebula, made at the Oxford University Observatory. By Prof. C. Pritchard, D.D., F.R.S.

The following observations were taken for measuring the brightness of the new star in the *Andromeda* nebula. It was not observed at Oxford till Sept. 7, when its brightness was compared with that of μ and ν *Andromedæ*, resulting in 8·25 mag. for the *Nova*. The star then rapidly declined in lustre until about the end of September, when it approached closely to the tenth magnitude. Since that time its brightness has faded so nearly to that of the nebula, that it is no longer measurable by the Photometer. Even during the latter part of the observations there has been very considerable difficulty in observing with exactness the magnitude of this star, on account of the brightness of the nebula in the background, which closely approaches that of the *Nova* in that portion of the nebula, near to which the star is situated. The image of that part of the nebula which appears in the photometric field, small as it is, and not exceeding a circle 25″ in diameter, nevertheless occupies a small *area* on the wedge, varying minutely in thickness, so that when the star is near the point of extinction some trace of an unextinguished light from the nebula is faintly visible.

From some cause or other, possibly connected with what has just been mentioned, the behaviour of the star in the nebula, as it approached extinction on the wedge, *even* in the earlier observations, was somewhat different from that of an ordinary star. It did not resemble the perfect point-like appearance which other stars present when near to extinction. In the large Refractor, however, no perceptible difference was observed between the *Nova* and other stars of similar brightness.

The following table contains an account of all the observations taken to fix the brightness of the *Nova* :